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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/502,104

09/19/2005

Dror Shemesh

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05/08/2009

APPLIED MATERIALS, INC.

C/O SONNENSCHN NATH & ROSENTHAL LLP

P.O. BOX 061080

WACKER DRIVE STATION, SEARS TOWER

CHICAGO, IL 60606-1080

EXAMINER

JOHNSTON, PHILLIP A

ART UNIT

PAPER NUMBER

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/502,104	<b>Applicant(s)</b> SHEMESH ET AL.	
	<b>Examiner</b> PHILLIP A. JOHNSTON	<b>Art Unit</b> 2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 January 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-5,9-15,17 and 19-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5,9-15,17 and 19-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 September 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

***Detailed Action***

1. This Office Action is submitted in response to the amendment filed 1-21-2009, wherein claims 1, 3, 5, 10, 13, 15, 17, and 19-21 have been amended. Claims 1-5, 9-15, 17, and 19-21 are pending.

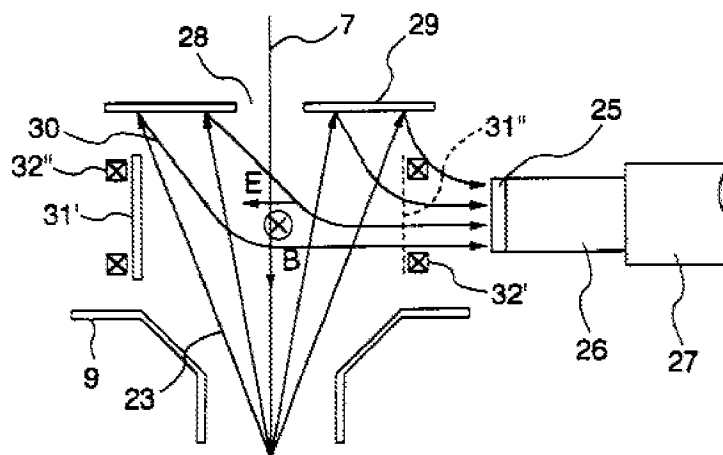
***Response to Arguments***

2. Applicant's arguments filed 1-21-2009 have been fully considered but they are not persuasive.

3. The Applicant argues at page 1 of the remarks that, Todokoro fails to teach or suggest deflectors placed at spaced apart locations along a column wherein a first location is upstream of an inner lens detector assembly and a second location is downstream of the same inner lens detector assembly. Instead, Todokoro teaches an upper detector 33 above an upper scanning deflector 15 and a lower detector 34 between the lower scanning deflector 16 and an acceleration tube. Todokoro, col. 8, lines 25-28. Based on this disclosure and elements 15, 33, 16, and 34 as shown in Figure 5, Todokoro clearly teaches an assembly using two different detectors. As such, Todokoro clearly fails to teach or suggest a deflection assembly having deflectors operable to apply deflection fields to the primary electron beam at spaced-apart locations along the column, at least a first of said locations being located downstream of an inner lens detector assembly and at least a second of said locations being located downstream of said inner lens detector assembly as recited in claims 1 and 13.

The examiner disagrees.

FIG.3



4. The Applicant also argues at page 1 of the remarks that Adamec fails to mention the deflection of a trajectory of the primary beam and is, in fact, limited to only the deflection of a primary electron beam. See *Adamec*, e.g. Figure 3 and column 8,

lines 1-29. In Figure 5 of Adamec, it appears that an objective lens may adjust the trajectory of the secondary electrons toward a detector. However, even if this adjustment were analogous to the deflection of a trajectory of a primary beam as recited in claims 1 and 13, Adamec still fails to teach or suggest deflecting a trajectory of the primary electron beam from the first optical axis to propagate along a second optical axis substantially parallel to and spaced-apart from the first optical axis, as recited in claims I and 13.

The examiner disagrees.

The applicant is respectfully directed to Figure 39 below in Adamec, where the beam is deflected away from the original beam axis by the first deflector 22 changing its trajectory so that the beam passes through aperture plate 21 along a second axis and then deflected back again to the original beam axis by deflector 23. See Col. 8, line 1-29, where Adamec also discloses the use of third deflection stage to conduct a parallel shift of the e-beam.

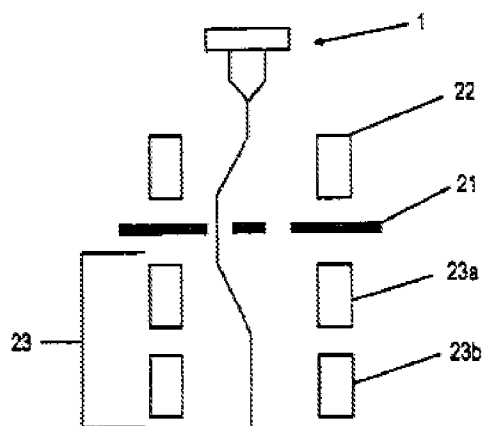


FIG. 3

One of ordinary skill recognizes from Figure 3 above that the deflected beam that passes through aperture plate 21 appears to have a trajectory along a second axis that is substantially parallel to and spaced apart from the first optical axis.

Therefore in light of the above, it is the examiners contention that Adamec teaches deflecting a trajectory of the primary electron beam from the first optical axis to propagate along a second optical axis substantially parallel to and spaced-apart from the first optical axis, as recited in claims I and 13.

5. The Applicant also argues at page 2 of the remarks that, the secondary electrons of Ose intersect the optical axis. See e.g. Ose, Figure 9. Additionally, the secondary electrons of Ose "fall in regions near the optical axis on the conversion electrode. Since the conversion electrode is provided with a central aperture through which the primary electron beam passes, some secondary electrons travel through the central aperture of the conversion electrode and are not detected." *Id.*, column 4, lines 40-45. Thus, the secondary electrons of Ose are the result of electron scattering and are not directed to a detector. Furthermore, the secondary electrons of Ose are not deflected from the first optical axis to propagate along a secondary optical axis to propagate along a second optical axis substantially parallel to and spaced-apart from the first optical axis as recited in claims I and 13.

The examiner disagrees.

Regarding the initial trajectory of the secondary electrons produced by the primary beam, claims 1 and 13 do not include the limitation " secondary electrons are deflected from the first optical axis to propagate along a secondary optical axis to

propagate along a second optical axis substantially parallel to and spaced-apart from the first optical axis", as described in the argument above, but rather states, "wherein the initial trajectory of at least some of the produced electrons is substantially coincident with one of the first and the second optical axes."

As stated in the previous office action, Ose specifically discloses at Col. 4, line 31-53 generating secondary electrons with a primary beam, where the secondary electrons have an initial trajectory that coincides with the axes of the primary beam.

Therefore in light of all the above, it is the examiners contention that the combination of Todokoro, Adamec and Ose discloses all the limitations of claims 1 and 13.

6. The rejection of claims 1-5, 9-15, 17, and 19-21 are maintained.

7. All claims stand finally rejected.

### ***Claims Rejection – 35 U.S.C. 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

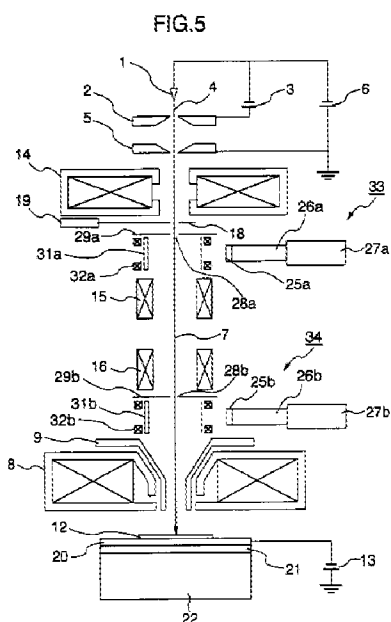
4. Claims 1-3, 5, 9-11, 13-15, 17, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,084,238 to Todokoro, in view of Adamec USPN 7,045,781, and in further view of Ose, USPN 6,787,772.

5. Regarding claim 13, Todokoro discloses a scanning electron microscope shown in Figure 5 below having;

(a) Primary electron beam 7 and a column through which the beam propagates along an axis to sample 12. See Col. 5, line 15-26,

(b) Scanning deflectors 15 and 16 are scanning deflectors, which deflect the primary beam across the sample 12. See Col. 5, line 45-53.

(c) sample 12 is located in the gap of the objective lens 8, where a high (substantial) electric field is introduced . Col. 8, line 15-21,



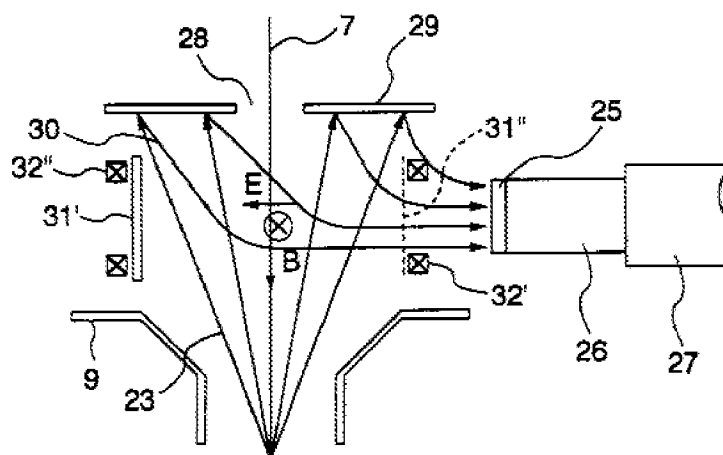
(d) impinging the primary beam on sample 12 to generate secondary electrons, that include reflected and scattered which are extracted into an aperture of the objective lens by the electric field applied across the objective lens and the sample where they are directed up through acceleration tube 9 towards one of the interior detectors. Col. 2, line 20-25; and Col. 5, line 15-26.

(e) Inner lens detector assembly 25, 26, 27 located between a pair of deflection coils 32 as shown in Figure 3 below that are used to deflect the primary beam, where



one of ordinary skill in the art would recognize that coil 32'' is an upstream deflector and coil 32' is a downstream deflector coil. See Col. 7, line 13-47.

FIG.3



Todokoro fails to disclose deflecting the primary beam away from the first optical axis to propagate along a second optical axis substantially parallel to and spaced-apart from the first optical axis.

Adamec discloses the use of deflecting units which deflect the beam away from the first optical axis to propagate along a second optical axis parallel to the first axis. See Col. 8, line 1-29; Col. 10, line 27-33; and note Figure's 3 and 5.

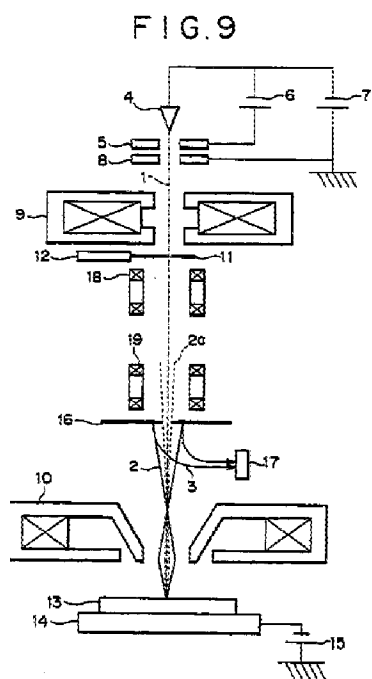
Adamec modifies Todokoro to provide a deflector to redirect the primary beam so that it propagates parallel to the principle axis and irradiates the sample with a parallel beam.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made that Todokoro would deflect the primary beam

in accordance with Adamec to provide a primary beam for parallel imaging in order to obtain higher throughput.

The combination of Todokoro and Adamec fails to teach the trajectory of at least some of the electrons is substantially coincident with one of the first and second optical axes.

Ose discloses irradiating a sample with a primary electron beam 1 in Figure 9 below where some of the generated secondary electrons 2a leave the surface of the sample near the primary beams optical axis. Col. 4, line 31-53



Ose modifies the combination of Todokoro and Adamec to provide means for detecting secondary electrons propagating near the optical axis of the primary electron beam

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made that the combination of Todokoro and Adamec

would use the detection means of Ose to detect secondary electrons that travel along a path slightly deviating from the optical axis thereby obtaining a high resolution two-dimensional electron image representing the shape of the surface of the specimen.

6. Regarding claim 1, the combination of Todokoro, Adamec and Ose discloses the apparatus used in this method claim, as pointed out above regarding claim 13.

7. Regarding claims 2 and 14, Todokoro discloses at Col. 4, line 64-67; and Col. 5, line 1-13, applying a negative superimposed voltage 13 to the sample 18 (a first voltage potential difference between the inspected object and a first portion of the column) and applying a post acceleration voltage 10 to acceleration tube 9 (a second voltage potential difference between a second portion of the column and the inspected object).

8. Regarding claims 3 and 15, Todokoro discloses at Col. 6, line 13-29, that voltage 13 is 500V and voltage 10 is 1000V. Also as shown in Figure 1, the first portion of the column is positioned below the second portion.

9. Regarding claims 5 and 17, Todokoro teaches the use of different detector collection zones. See Col. 9, line 36-43.

10. Regarding claims 9 and 19, Todokoro teaches an area of the inspected object is positioned within the substantial electrostatic lens (note Figure 4); and Col. 8, line 16-21.

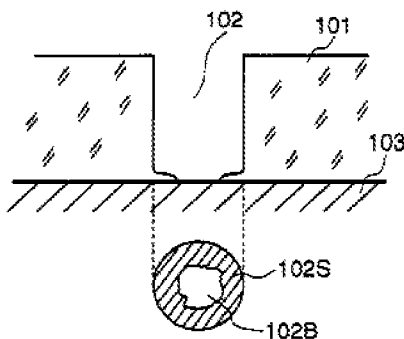
11. Regarding claims 10, 11, and 20, Todokoro teaches tilting the sample and measuring the inclination. Col. 14, line 5-15.

12. Claims 4,12, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,084,238 to Todokoro, in view of Adamec USPN 7,045,781, in further view of Ose, USPN 6,787,772, and in still further view of Todokoro, U.S. Patent No. 6,635,873.

13. Regarding claims 4, 12, and 21 the combination of Todokoro (238), Adamec and Ose discloses nearly all the limitations of claims 4, 12, and 21 as described above regarding claim 13, but fails to disclose processing the received detection signals to provide an indication about a defect or a process variation; and wherein detected electrons include electrons from a lower portion of a high aspect ratio hole.

14. Todokoro (873) teaches observing residue at the bottom of a high aspect ratio contact hole. See Figure 14b below; Col. 2, line 8-18; and Col. 5, line 39-49.

**FIG. 14B**



15. Todokoro (873) modifies the combination of Todokoro (238), Adamec and Ose to provide a technique for displaying the condition of a contact hole formed in an insulator on the display screen of a scanning electron microscope.

16. Therefore it would have been obvious to one of ordinary skill in the art that the combination of Todokoro (238), Adamec and Ose would use the contact hole

imaging technique of Todokoro (873) to provide a scanning electron microscope for observing the bottom of a contact hole formed on an observation sample such as an IC.

### ***Conclusion***

7. The Amendment filed on 1-21-2009 has been considered but is ineffective to overcome the references cited in the Office Action mailed 10-21-2008.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:00 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor Robert Kim

can be reached at (571) 272-2293. The fax phone number for the organization where the application or proceeding is assigned is 571 273 8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ  
January 16, 2009

/ROBERT KIM/

Supervisory Patent Examiner, Art Unit 2881